

## CHM 3610: Inorganic Chemistry

Summer 2019

Class Time: MTWRF 9:30 – 10:45

Room: LEI 0207

**Instructor:** Trevor A. Makal

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**Office Phone Number:** 394-2170

**Office Location:** CLB 419

**Office Hours:** M and R 10:50 – 12:00, and by appointment

**Teaching Assistants:** Pratik Roy ([pratik5510@chem.ufl.edu](mailto:pratik5510@chem.ufl.edu))

Rinku Yadav ([rinkuyadav@chem.ufl.edu](mailto:rinkuyadav@chem.ufl.edu))

**TA Office Hours:** TBA

**Disclaimer:** The instructors reserve the right to make changes or corrections to this syllabus at any time. Students will be notified when any change is made by an announcement on Canvas.

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**Prerequisites:** CHM 2211 and 2211L, or equivalent

### Course Objectives:

The goal of this course is to introduce the foundations of inorganic chemistry based upon first principles. Analyses of periodic properties, chemical bonding, molecular geometry, symmetry and spectroscopy, and structure and reactivity will be conducted based upon application of quantum mechanics. Structure, bonding, and reactivity of coordination compounds will also be discussed.

Students successfully completing this course should be able to:

- Identify point groups of species.
- Use symmetry and group theory to predict vibrational modes of chemical species.
- Identify molecular orbitals involved in bonding of chemical species and draw qualitatively accurate molecular orbital energy-level diagrams.
- Predict properties of atomic and molecular species based upon periodic trends of the main group elements.
- Understand the differences and limitations of crystal field theory and ligand field theory, and predict impacts of different ligands/metals on electronic transitions in coordination compounds.
- Apply appropriate bonding theories to explain connectivity in molecular and supramolecular species.
- Name coordination complexes and predict reactions

**Text:** Principles of Inorganic Chemistry, Pfennig, Wiley

### Other Resources:

1. **WebElements:** <http://www.webelements.com/> (Very informative periodic table)

2. **Orbitron:** <http://winter.group.shef.ac.uk/orbitron/> (Visualization of atomic orbitals)
3. **Symmetry @ Otterbein:** [symmetry.otterbein.edu/index.html](http://symmetry.otterbein.edu/index.html) (great point group practice)
4. Inorganic Chemistry, Catherine Housecroft and Alan G. Sharpe, 3<sup>rd</sup> Edition, W.H. Freeman and Company
5. Inorganic Chemistry, Miessler, Fischer, and Tarr, 5<sup>th</sup> Edition, Pearson
6. Chemistry of the Elements, by Greenwood and Earnshaw, 2<sup>nd</sup> Edition, Elsevier
7. Basic Inorganic Chemistry, by Cotton, Wilkinson, and Gaus, 3<sup>rd</sup> Edition, Wiley
8. Advanced Inorganic Chemistry, by Cotton and Wilkinson, 6<sup>th</sup> Edition, Wiley

### Course Grading:

	Problem Sets	100	
	Mid-term Exams (3)	300	
	Final	100	
500 – 460	A	410 – 400 B-	349 – 340 D+
459 – 450	A-	399 – 390 C+	339 – 310 D
449 – 440	B+	389 – 360 C	309 – 300 D-
439 – 410	B	359 – 350 C-	299 – 0 F

*\*\*\*Notes on grading: (1) Grade cut-offs are subject to change. (2) Extra credit will not be given on an individual basis, but may be made available to the class as a whole. (3) Grades are not assigned based on a Gaussian distribution.*

*\*\*Note: you have two weeks to request a re-grade of an exam or problem set.\*\* After two weeks the score will be final. Warning: we photocopy exams and problems sets and will check with the copy prior to re-grading*

### Problem Set Grading:

Problem Sets are due at the beginning of class. Problem sets handed in immediately after class but on the same day will be assigned a grade of M (6.25 pts). Problem sets handed in after the due date will not be graded (0 pts) Solutions will be provided.

Grading: Problem sets will be graded as follows

Satisfactory: S (12.5 pts)

Marginal: M (6.25 pts)

Unsatisfactory: U (0 pts)

Satisfactory (S): problems were attempted and there is an obvious understanding of the material demonstrated. (i.e. just attempting a question is not satisfactory)

Marginal (M) grade will be assigned for sloppy work, not attempting a problem, if a significant portion is incorrect.

Unsatisfactory (U): majority of the problem set is incorrect.

### Course Attendance:

Attendance is mandatory for exams. Acceptable reasons for absence from class include illness\*, serious family emergencies, special curricular requirements (e.g., judging trips, field trips, professional conferences), military obligation, severe weather conditions, religious holidays, court- imposed legal obligations (e.g., jury duty or subpoena), and participation in official university activities such as music performances, athletic competition, or debate.

\*The university's policy on appropriate documentation of absence due to illness can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> and <http://shcc.ufl.edu/forms-records/excuse-notes/>. Material will be covered in class that does not appear in the textbook, so course attendance is expected and highly recommended.

### **Review Sessions:**

Each Friday the lecture will be a review session. The topic will be the problem set/exam answer key and to answer student questions.

### **Missed Exams:**

To receive a make-up quiz or exam, the student must provide the Dean of Students office (DSO) with appropriate documentation who will then notify the instructors if absence satisfies UF's Attendance & Absence Policy. Notifications from the DSO or appropriate body at UF (*e.g.*, UAA representative) must be provided **at least one week in advance for predetermined absences** (*e.g.*, official university activity). For all other circumstances where one-week advance notification from the DSO is not possible (*e.g.*, illness), students must **email their TA as soon as possible and preferably before the exam that will be missed for unplanned absences**. Students are then required to provide DSO with appropriate documentation to satisfy the Attendance & Absence Policy for that missed date, who will subsequently notify the instructors. Make-up quizzes and exams will be administered only if absence from the exam or quiz has the approval of the appropriate DSO staff. *Advice: Medical personnel only provide documentation if they actually examine you when you are ill.*

### **Regrade/Score Change:**

All queries regarding exam, quiz, or other scores must be made **within one week** after the score has been posted to Canvas without exception. After this one-week period, scores will be considered final. Concerns regarding points awarded should first be addressed to your TA. The TA will notify the instructor and the student's course record will be amended if the student's concerns are valid. If the student is dissatisfied with the TA's response (*e.g.*, the TA does not agree that more points should have been awarded), the student may request a regrade of the exam by the instructor. In this scenario, the entire exam will be regraded and not only a specific question; that is, the points awarded on questions unrelated to the student concerns can also change. **Submitting an exam for a regrade is your consent to accept the score awarded from the regraded exam as the score of record *even if it is lower than the initially awarded score.***

### **Honesty Policy:**

All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others. Students are required to be honest in their coursework. Any act of academic dishonesty will be reported to the Dean of Students, and may result in failure of the assignment in question and/or the course. *N.B. Unauthorized recordings are a violation of the honor code §3.i.* UF's honor code: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>.

### **Accommodation for Students with Disabilities:**

Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

## **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative ([www.umatter.ufl.edu/](http://www.umatter.ufl.edu/)) is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

## **Course Outline:**

Chapter 3: Quantum Theory: Review/Introduction

Chapter 4: Atomic Structure

Chapter 5: Periodic Trends

### **Midterm Exam I, May 20 (Monday)**

Chapter 6: Intro to Chemical Bonding

Chapter 7: Molecular Geometry

Chapter 8: Molecular Symmetry

### **Midterm Exam II, May 31 (Friday)**

Chapter 9: Vibrational Spectroscopy

Chapter 10: Covalent Bonding

(Valence bond theory and molecular orbital theory)

Chapter 11: Metallic Bonding

Chapter 12: Ionic Bonding

Chapter 14: Structure and Reactivity

### **Midterm Exam III, June 10 (Monday)**

Chapter 15: Intro to Coordination Chemistry

Chapter 16: Structure, Bonding, and Spectroscopy of Coordination Compounds

(Skip molecular term symbols and T-S diagrams)

Chapter 17: Reactions of Coordination Compounds (An overview)

Chapter 18: Structure and Bonding in Organometallic Compounds (An overview)

### **Cumulative Final Exam, June 21 (Friday)**

## **Academic Calendar:**

First Day of Class: May 13<sup>th</sup>

Memorial Day: May 27<sup>th</sup>

Drop Deadline: June 14<sup>th</sup>

Last Day of Class: June 21<sup>st</sup>